a polynucleotide detecting cell provided with a first electrode to which different DNA probes are fixed in luminous areas differing with a type of DNA probe and a second electrode(s) opposite to said first electrode;

a voltage applying unit for applying a voltage between said first electrode and said second electrode; and

an optical detector for detecting target polynucleotides which are trapped by hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides,

wherein an extending reaction using a base labeled with an electrochemiluminescence (ECL) label to extend said hybridized DNA probes is performed, ECL resulting from the application of said voltage is detected, and the presence or absence of any extended chain generated by said extending reaction is detected.

2. (Amended) A polynucleotide assay apparatus according to claim 1, wherein said ECL label is a ruthenium complex or an osmium complex.

3. (Amended) A polynucleotide assay apparatus according to claim 1, wherein said optical detector is a pickup device for detecting said ECL from a plurality of said luminous areas as a 2D image.

4. (Amended) A polynucleotide assay apparatus according to claim 1, wherein said second electrode is configured of a plurality of electrodes, said apparatus further comprises electrode selectors for selecting a prescribed electrode out of said plurality of electrodes,

wherein said voltage is applied between said electrode selected by said electrode selector and said first electrode to detect ECL from a prescribed luminous area selected out of said plurality of luminous areas.

5. (Amended) A polynucleotide assay apparatus according to claim 4, wherein said electrode selector is provided with TFT gate lines each connected to each of said plurality of electrodes.

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6. (Amended) A polynucleotide assay apparatus according to claim 1, wherein said first electrodes and said second electrodes are arranged on the same plane in alternate repetition in parallel in one direction, said apparatus further comprises a device for controlling the duration of the application of said voltage on the basis of the velocity of the expansion of the region in which said ECL occurs and the distance between the center line of said first electrodes arranged in alternate repetition in said one direction and the center line of said second electrode in said one direction.

7. (Amended) A polynucleotide assay apparatus according to claim 6, wherein said voltage is repeatedly applied.

8. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first electrode to which different DNA probes are fixed in luminous areas differing with a type of DNA probe and a second electrode(s) opposite to said first electrode;

a voltage applying unit for applying a voltage between said first electrode and said second electrode; and

an optical detector detecting target polynucleotides which are trapped by hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides to which is coupled an oligonucleotide labeled with an electrochemiluminescence (ECL) label.

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9. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first electrode to which different DNA probes are fixed in luminous areas differing with a type of DNA probe and a second electrode(s) opposite to said first electrode;

a voltage applying unit for applying a voltage between said first electrode and said second electrode; and

an optical detector for detecting target polynucleotides which are trapped by hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides labeled with an electrochemiluminescence (ECL) label, by detecting ECL resulting from the application of said voltage.

10. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first electrode to which different DNA probes are fixed in luminous areas differing with a type of DNA probe and a plurality of second electrodes opposite to said first electrode;

electrode selectors for selecting an electrode out of said plurality of second electrodes; and

a voltage applying unit for applying a voltage between said first electrode and said selected electrode, wherein target polynucleotides which are labeled with an electrochemiluminescence (ECL) label and trapped by hybridization between said target polynucleotides and said DNA probes are detected for each luminous area selected out of said plurality of luminous areas, by generating ECL from said ECL label by the application of said voltage.

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11. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first electrode to which different DNA probes are fixed in luminous areas differing with a type of DNA probe and a plurality of second electrodes arranged on the same plane as said first electrode, wherein each of said plurality of second electrodes is separated from said first electrode and arranged in the central part of each of said luminous areas;

electrode selectors for selecting an electrode out of said plurality of second electrodes;

a voltage applying unit for applying a voltage between said first electrode and said selected electrode;

an optical detector for detecting an electrochemiluminescence (ECL) generated from ECL labels which label target polynucleotides, by the application of said voltage; and

a device for controlling the duration of the application of said voltage on the basis of the distance between the central part of said selected second electrode and the boundary of

said luminous area adjoining said luminous area in which said selected second electrode is arranged and the velocity of the expansion of the region in which said ECL occurs,

wherein said target polynucleotides trapped, by hybridization between said target polynucleotides and said DNA probes, in each of said luminous areas are detected.

B4 cont

12. (Amended) A polynucleotide assay apparatus according to claim 11, wherein said plurality of second electrodes are arranged at equal intervals in two directions.

13. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first electrode to which different DNA probes are fixed in luminous areas differing with a type of DNA probe and a plurality of second electrodes arranged on the same plane as said first electrode;

electrode selectors for selecting an electrode out of said plurality of second electrodes;

a voltage applying unit for applying a voltage between said first electrode and said selected electrode;

an optical detector for detecting an electrochemiluminescence (ECL) generated from ECL labels which label target polynucleotides, by the application of said voltage; and

a device for controlling the duration of the application of said voltage on the basis of the velocity of the expansion of the region in which said ECL occurs,

wherein said target polynucleotides trapped, by hybridization between said target polynucleotides and said DNA probes, in each of said luminous areas are detected.

14. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first electrode to which different DNA probes are fixed in luminous areas differing with a type of DNA probe and a plurality of second electrodes opposite to said first electrode;

electrode selectors for selecting an electrode out of said plurality of second electrodes; and

a voltage applying unit for applying a voltage between said first electrode and said selected electrode,

wherein target polynucleotides which are labeled with an electrochemiluminescence (ECL) label and trapped, by hybridization between said target polynucleotides and said DNA probes, in each of said luminous areas are detected by detecting for each luminous area selected out of said plurality of luminous areas, by generating ECL from said ECL labels by the application of said voltage.

20. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first plate whereon a first electrode to which different DNA probes are fixed in a plurality of luminous areas differing with a type of DNA probe is formed and a second substrate which is arranged opposite to said first electrode and whereon a plurality of second electrodes are formed opposite to said plurality of luminous areas;

a voltage applying unit [(44)] for applying a voltage between said first electrode and said second electrode; and

an optical detector for detecting target polynucleotides which are trapped by hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides,

wherein an extending reaction using a base labeled with an electrochemiluminescence (ECL) label to extend said hybridized DNA probes is performed, ECL resulting from the application of said voltage is detected, and the presence or absence of any extended chain generated by said extending reaction is detected.

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21. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first plate whereon a first electrode to which different DNA probes are fixed in a plurality of luminous areas differing with a type of DNA probe is formed and a second substrate which is arranged opposite to said first electrode and whereon a plurality of second electrodes are formed opposite to said plurality of luminous areas;

a voltage applying unit for applying a voltage between said first electrode and said second electrode; and

an optical detector for detecting target polynucleotides which are trapped by hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides to which is coupled an oligonucleotide labeled with an electrochemiluminescence (ECL) label, by detecting ECL resulting from the application of said voltage.

22. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first plate whereon a first electrode to which different DNA probes are fixed in a plurality of luminous areas differing with a type of DNA probe is formed and a second substrate which is arranged opposite to said first electrode and whereon a plurality of second electrodes are formed opposite to said plurality of luminous areas;

a voltage applying unit for applying a voltage between said first electrode and said second electrode; and

B5 cont

an optical detector for detecting target polynucleotides which are trapped by hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides labeled with an electrochemiluminescence (ECL) label, by detecting ECL resulting from the application of said voltage.

23. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first electrode to which DNA probes are fixed in luminous areas differing with a type of DNA probe and a plurality of second electrodes arranged on the same plane as said first electrode, wherein each of said plurality of second electrodes is separated from said first electrode, and arranged in the central part of each of said luminous areas, and arranged at equal intervals in two directions;

electrode selectors for selecting an electrode out of said plurality of second electrodes;

a voltage applying unit for applying a voltage between said first electrode and said selected electrode;

an optical detector for detecting an electrochemiluminescence (ECL) generated from ECL labels which label target polynucleotides, by the application of said voltage; and

a device for controlling the duration of the application of said voltage on the basis of the distance between the central part of said selected second electrode and the boundary of said luminous area adjoining said luminous area in which said selected second electrode is arranged and the velocity of the expansion of the region in which said ECL occurs,

wherein said target polynucleotides trapped, by hybridization between said target polynucleotides and said DNA probes, in each of said luminous areas are detected.

B5 cont

24. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first electrode to which DNA probes are fixed in luminous areas differing with a type of DNA probe and a plurality of second electrodes arranged on the same plane as said first electrode, wherein each of said plurality of second electrodes is separated from said first electrode, and arranged in one direction in parallel with part of said first electrode;

electrode selectors for selecting an electrode out of said plurality of second electrodes;

a voltage applying unit for applying a voltage between said first electrode and said selected electrode;

an optical detector for detecting an electrochemiluminescence (ECL) generated from ECL labels which label target polynucleotides, by the application of said voltage; and

a device for controlling the duration of the application of said voltage on the basis of the velocity of the expansion of the region in which said ECL occurs,

wherein said target polynucleotides trapped, by hybridization between said target polynucleotides and said DNA probes, in each of said luminous areas are detected.

25. (Amended) A polynucleotide assay apparatus comprising:

a polynucleotide detecting cell provided with a first plate whereon a first electrode to which different DNA probes each having a phosphorothioate bond are fixed in a plurality of luminous areas differing with a type of DNA probe is formed and a second substrate which is arranged opposite to said first electrode and whereon a plurality of second electrodes are formed opposite to said plurality of luminous areas;

a voltage applying unit for applying a voltage between said first electrode and said second electrode; and

an optical detector for detecting target polynucleotides which are trapped by hybridization between said DNA probes fixed to said luminous areas and said target polynucleotides,

wherein an extending reaction using a base labeled with an electrochemiluminescence (ECL) label to extend said hybridized DNA probes is performed, ECL resulting from the application of said voltage is detected, and

the presence or absence of any extended chain generated by said extending reaction is detected.